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# INFLUENCE OF TIMBER CHARACTERISTICS UPON STUMPAGE PRICES

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## UPON STUMPAGE PRICES

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This paper summarizes the results of an analysis of stumpage prices for the period January 1949 through March 1955. The data consisted of records of 334 southern pine sawtimber sales from National Forests in Mississippi, Louisiana, and Texas.

The objective was to relate variations in stumpage prices to measurable characteristics of the timber--differences in volume sold, cut per acre, quality, and the like. Such characteristics are here referred to as price determinants. The ultimate purpose was to lay the basis for a price-reporting system that would permit the appraisal of specific parcels of timber by comparing them, in terms of the main price determinants, with the prevailing market.

A reporting service would have many values besides the obvious one of helping forest managers balance silvicultural objectives against economic ones. It would tend to improve forest management among small landowners, at least to the extent that price information enhances timber returns. It would be useful in damage claims and tax problems, where appraisal by comparison is the usual procedure. Knowledge of the premium paid for grade should give foresters a basis for evaluating the economic limits to growing quality timber. The reports would also be of some service in regional supply and demand analyses.

One barrier to definitive price reporting has been the scarcity of reliable data. Another has been the lack of proof that useful associations could be derived even from suitable data. In this study, National Forest timber sales were analyzed as a first step toward price reporting, since details on timber sold and prices paid were more accurately known than for private sales. The results show that much of the price variation in these sales was attributable to a few readily measured factors. It thus appears that the problem of taking and analyzing standardized measurements of private sales can be approached with reasonable assurance that results will be commensurate with the effort.

The analysis was conducted in two parts. The first was exploratory, and dealt with sales between January 1949 and June 1953. The second part utilized the initial findings to evaluate additional variables and to demonstrate reasonable stability of the price determinants over the period July 1953 to March 1955.

## Price Determinants Discernible

In the first phase of the investigation, data were taken from 243 sealed-bid southern pine sawtimber sales, many of which included varying proportions of upland hardwoods. The Mississippi National Forests, exclusive of the Holly Springs unit, furnished 101 sales; the Texas National Forests, 94; and the Kisatchie National Forest, in Louisiana, 48. An analysis was made of all variables that were presumably related to stumpage prices, provided that they were common to the sales records and could be expressed quantitatively.

Eight such variables were identified and tested for association with the pine price received per MBF (net Scribner Decimal C log scale). To simplify the analysis, the variables were coded as follows:

1. Pine price received per MBF, in dollars measured to the nearest tenth (low 15.5, average 32.7, high 54.0).

2. Time of sale--months serially numbered from 1 for January 1949 through 54 for June 1953.

3. Gross volume of pine sold, in units of 100 MBF measured to the nearest 10 MBF (low 20 MBF, average 1,380, high 5,230).

4. Pine cut per acre, in units of MBF to the nearest 100 board feet (low 200 board feet, average 1,200, high 2,700).

5. Distance to the nearest hard road, graded gravel or better, measured in miles (low 0, average 1, high 9).

6. Average d.b.h. of pine sold--tree of mean basal area computed to the nearest tenth inch of tree diameter (low 11.8 inches, average 13.8, high 17.6).

7.  Hardwood ratio--the volume of hardwoods tied to the pine sale, expressed as a proportion of the gross pine volume to the nearest hundredth (low 0, average .34, high 6.36).

8.  Number of bids received (low 1, average 4, high 11).

9.  Average volume per tree, in board feet (low 74 board feet, average 103, high 200).

Time of sale (with its implications of rising or falling prices) was included as an arbitrary variable for practical considerations. If it had been possible to obtain an adequate number of sales occurring at a given instant, stumpage price determinants uncontaminated by time could have been isolated. But since it was necessary to cover a span of years in order to secure enough data, statistical procedures had to be used to eliminate, at least in part, the effect of time. Too, the use of time as a variable showed that, on the average, pine sales tended to become larger over the period ($r_{23}$ = .151*), while cut per acre ($r_{24}$ =-.216**) and tree size ($r_{26}$ = -.343**) declined.[1]

With the effect of time largely eliminated, it was possible to evaluate more closely the relationships between price and the other variables. The significant associations between stumpage prices and the independent variables are listed in table 1. The table shows that-- with time held constant--volume, cut per acre, and the number of bids received for the timber were positively correlated with price. Hardwood ratio was negatively correlated. Thus, higher pine prices were associated with increasing sale size, heavier cuts per acre, and more bids. In contrast, increases in the hardwood ratio tended to lower pine price. These points are not particularly new, but they have seldom been quantified.

The data also yielded highly significant associations between number of bids and volume of sale ($r_{38.2}$ = .404**), cut per acre ($r_{48.2}$ = .348**), and hardwood ratio ($r_{78.2}$ = -.259**). This suggests that forest managers can affect timber prices by the way in which they mark trees for sale. That is, bids are not solely a function of advertising but are influenced by the nature of the timber offering. Thus, bids appear to be a joint variable in that they are related to timber supply factors as well as to demand.

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[1] Throughout this paper:
  * = significant at the 5-percent level.
  ** = significant at the 1-percent level.

Table 1. --Correlation coefficients for sales between January 1949 and June 1953, with stumpage price as the dependent variable

| Independent variable | Gross simple association | Variables held constant | |
| --- | --- | --- | --- |
| | | Time | Number of bids and time |
| Time (2) | .639** | . . . | . . . |
| Sales volume (3) | .407** | .409** | .241** |
| Cut per acre (4) | ( 1/ ) | .286** | ( 1/ ) |
| Mean tree d.b.h. (6) | -.237** | ( 1/ ) | ( 1/ ) |
| Hardwood ratio (7) | -.200** | -.197** | ( 1/ ) |
| Number of bids (8) | .389** | .563** | . . . |

1/ Correlation coefficient was nonsignificant.

Among trees of a given diameter, those with the greater volume will generally have less taper, more merchantable length, and higher quality. In Texas, the bulk of the timber offerings fell into a very few average tree diameter classes, but the average volume per tree varied widely within each diameter class. In these sales, therefore, it was possible to make a separate analysis with average tree volume, rather than average diameter, as an index of timber quality. As in all sales, time and bids proved significantly related to price. Beyond that, quality (average tree volume) was significantly associated with price ($r_{19.28} = .302$**). It seems clear that a premium was being paid for high-grade timber.

Covariance analysis was used to test the hypothesis that the determinants of pine stumpage prices are essentially the same throughout the region covered by this study. The regression coefficients for time and bids did not differ significantly between the Kisatchie, Mississippi, and Texas sales. On the other hand, the mean bid prices (adjusted for time differences) were different at the 1-percent level of significance. These significant mean differences are due to variations among the three sale areas in mean volume, cut per acre, hardwood ratio, and number of bids:

| Area | Volume | Cut per acre | Hardwood ratio | Bids |
|------|--------|--------------|----------------|------|
|      | 100 MBF | MBF |  | No. |
| Kisatchie | 8.6 | 0.8 | 0.90 | 3.6 |
| Mississippi | 11.1 | 1.2 | .27 | 3.9 |
| Texas | 19.3 | 1.3 | .14 | 4.9 |

In essence, the data indicate the existence of a rather broad price zone for pine stumpage in the study area.

### Stability of Price Determinants

The chief consideration in the second part of the study was to substitute readily measurable characteristics of the timber for such variables as time and number of bids. The National Forest units used initially were drawn upon for data from 91 additional pine saw-timber sales made between July 1953 and March 1955. This period was characterized first by gradually falling and then by rising prices in the wholesale lumber market. As reported in the "Wholesale Price Index" of the Bureau of Labor Statistics, No. 2 common southern pine boards (1 x 6 inches) sold for $78 per MBF in July 1953, fell to $70 in May 1954, and then rose to $77 in March 1955.

The analysis showed that stumpage prices were directly related to timber characteristics and that the relationships were unaffected by rising and falling lumber markets.

The independent variables included five that had been found related to price in the initial study, plus three new ones:

    a.   Pine price received per MBF (low 15.3, average 31.1, high 48.6).

    b.   Gross volume of pine sold (low 1,300 MBF, average 1,800, high 5,460).

    c.   Pine cut per acre (low 300 board feet, average 1,200, high 5,100).

    d.   Hardwood ratio (low 0, average .31, high 2.86).

e. Number of bids received (low 1, average 4, high 11).

f. Average volume per tree in board feet (low 58 board feet, average 103, high 161).

g. Tree volume per unit basal area, i.e., total pine volume sold divided by the sum of tree diameters squared (low 42 board feet, average 59, high 80).

h. Wholesale price of No. 2 common boards (1 x 6) for month prior to sale to the nearest tenth dollar (low 70.3, average 75.4, high 78.7).

i. Wholesale price of No. 2 common boards 2 months prior to sale (low 70.3, average 75.7, high 79.4).

Table 2 summarizes the significant associations between stumpage prices and these variables. (The relevant data for the period January 1949 through March 1955 are given in the appendix, p. 12.) As in the prior analysis, stumpage-price differences were associated with variations in the volume of pine offered, cut per acre, and hardwood ratio. Timber quality, as judged by average tree volume per unit basal area, was also related to pine price. Further, an association was found between stumpage prices and wholesale lumber price for the month prior to that of the sale.

Table 2.--Correlation coefficients for sales between July 1953 and March 1955, with stumpage price as the dependent variable

| Independent variable | Gross simple association | Variables held constant | | | | |
|---|---|---|---|---|---|---|
| | | Lumber price | Sale volume and lumber price | Cut per acre, sale volume, and lumber price | Hardwood ratio, cut per acre, sale volume, and lumber price | Tree volume, hardwood ratio, cut per acre, sale volume, and lumber price |
| Sale volume (b) | .539** | .536** | . . . | . . . | . . . | . . . |
| Cut per acre (c) | .476** | .487** | .379** | . . . | . . . | . . . |
| Hardwood ratio (d) | -.464** | -.469** | -.309** | -.218** | . . . | . . . |
| Number of bids (e) | .525** | .511** | .527** | .457** | .437** | .408** |
| Tree volume (g) | .331** | .382** | .284** | (1/) | .292** | . . . |
| Lumber price (h) | .206* | . . . | . . . | . . . | . . . | . . . |

1/ Correlation coefficient was nonsignificant.

These associations appear reasonable. Larger sales should bring better prices because they tend to minimize cost per MBF to the purchaser for evaluation and inspection. A large purchase, as opposed to several smaller ones of equal total volume, eliminates much of the expense of moving from one logging chance to another. The relation between stumpage prices and cut per acre harmonizes with the general opinion that logging costs per MBF decline as cut per acre increases. The prevailing low quality of most southern upland hardwoods (on pine sites) probably accounts for the negative correlation between price and amount of hardwood in the sale. Quality apart, pine operators find hardwoods difficult to manufacture and market. The positive correlation between timber quality and stumpage prices is gratifying, but not surprising.

The regression equation is:
$$Y_a = -24.97 + .54X_h + .18X_b + 2.28X_c - 4.08X_d + .17X_g$$
It accounts for 47 percent of the price variation; the standard error is $5. Figure 1 portrays the net effect of each of the four timber characteristics included in the regression equation. As can be seen from table 2, the factor of bids received is capable of enhancing the precision with which the study sales can be described.

These results are encouraging, especially since the index of timber quality was very rough. In all sales, the trees had been marked chiefly because of disease, insect infestation, risk, or poor quality, or because they were suppressing other trees. Thus many of the large trees were rougher and
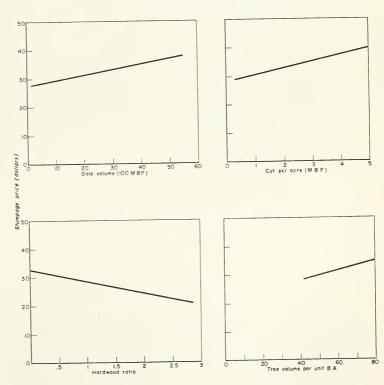


Figure 1.--Net regression lines for each of the timber characteristics that were found related to stumpage price.

more defective than the small ones. In effect, average tree volume, even when adjusted for basal area differences, was not so closely related to quality as can be expected after these forests have been managed long enough so that the sale timber comes from harvest rather than intermediate cuts. It seems fair to assume that records of sales in which butt logs of marked trees were graded with the Interim Log Grades for Southern Pine (4)[2/] would yield a substantial improvement in the percentage of stumpage price variation accounted for by differences in timber quality.

That the price determinants are quite stable is indicated by covariance analysis that compared sales for the period of declining prices with those when prices were rising. In these comparisons, no significant differences were found in the regression coefficients for sale volume, cut per acre, and hardwood ratio, nor in mean price associated with these factors. A significant difference in the regression coefficients for timber quality was not accompanied by any difference in mean price. The different effect of quality in a rising and falling market is probably due to the crudity of the index of timber quality.

Twice as many bids were received per sale when prices were rising as when they were falling (4.8 bids per sale vs. 2.4). The difference was almost exactly balanced by an upward displacement of the regression surface during the period of falling prices, so that the bid coefficients and the mean prices in the two periods showed no significant difference.

All of these comments apply to periods of moderate changes in lumber prices. Precipitous price changes would very likely render determinants impossible to identify.

## Price Reports

Excellent studies of private timber sales have been made (1, 3, 6, 7). Repeatedly, these studies have demonstrated that the woodland owner profits from knowing what he has to sell and from seeking competitive bids. They also give some indication that the relative

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2/ Underscored numbers in parentheses refer to Literature Cited, p. 11.

quality of the timber offering influences stumpage prices. In contrast, and for very good reasons, there is a notable scarcity of studies relating stumpage prices to measurable characteristics of the timber (2, 5).

The chief problem in definitive price reporting has always been to reconstruct pertinent data from past transactions. Generally this has been a matter of supplementing scanty written records by recourse to stump measurements and the fragile memories of buyers and sellers. Such data necessarily contain errors that preclude any reasonable chance of relating prices to timber characteristics. Today, however, an opportunity for better data exists in the corps of public and private foresters who offer marking and marketing services to woodland owners. By collecting very little more data than is already required of them, these foresters could provide the material for a price-reporting service.

The price determinants revealed in this analysis cannot, of course, be applied indiscriminately to other areas or price populations.

The timber characteristics that affect stumpage prices are likely to differ from place to place and possibly between public and private sales. Accessibility may be a key factor in the mountains, despite its lack of importance in the Coastal Plain area studied. In hardwood regions, species composition and grade are likely to be even more important than with pine.

These considerations suggest that definitive price-reporting services are dependent upon research to establish price determinants by forest zones. In such research it will be advantageous to take data over the shortest possible time span. Since most investigations will have to rely on existing and probably not well-standardized records, initial results are likely to be only moderately definitive.

In planning the reporting service, care should be exercised to ensure standardized measurements of the important variables in the most rigorously objective fashion possible. For example, one of the various ways of linking butt-log grade to tree diameter and merchantable length will probably yield a better quality index than can be obtained from subjective grading of upper logs in standing timber. Too, it is likely that board-foot estimates of volume per acre give a less efficient measure of timber concentration than could be obtained by summing the products of tree diameter squared and total height ($\Sigma D^2 H$). As better quality data accumulate, it should be possible to improve the precision of the price reports.

## Summary

A study of southern pine sawtimber sales from National Forests in Mississippi, Louisiana, and Texas yielded quantitative evidence in support of the following hypotheses:

Although southern pine sawtimber is not ordinarily sold by grade, purchasers tend to recognize differences in timber quality and pay a premium for it.

The price paid for stumpage tends to increase with the total volume offered and with its concentration (in terms of cut per acre), and to decrease with increases in the ratio of hardwood added to the pine.

Stumpage prices are associated with changes in the wholesale market price for southern pine lumber.

The determinants of market price for pine stumpage were essentially the same for sales in all 3 States.

The study dealt exclusively with National Forest sales, but it seems likely that the findings could be applied to private sales in the same general region. Such application might take the form of a price-reporting service that would permit the appraisal of specific parcels of timber by comparison, in terms of the main value determinants, with going prices. Provision would of course have to be made to assure standardized measurements of pertinent timber characteristics.

The method of analysis outlined in this paper should prove useful in identifying the price determinants in different forest zones.

Needless to say, timber characteristics do not entirely govern stumpage prices; factors on the demand side also enter in. To begin with, however, forest managers will be served best if stumpage price variations are accounted for in terms of timber characteristics. When possibilities on this side of the price scissors have been exhausted, demand factors could be used to further improve the price reports.

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Table 3.--Sales data for January 1949 through June 1953

| Sale price per MBF (dollars) | Date | Bids received | Pine volume | Pine cut per acre | Hardwood volume | Sale price per MBF (dollars) | Date | Bids received | Pine volume | Pine cut per acre | Hardwood volume |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | 100 MBF | MBF | Ratio | | | Number | 100 MBF | MBF | Ratio |
| 30.0 | 1/49 | 4 | 27.9 | 1.4 | .17 | 34.8 | 3/50 | 11 | 21.0 | 1.3 | ... |
| 25.5 | 1/49 | 6 | 13.5 | 1.3 | .07 | 28.2 | 3/50 | 5 | 17.4 | 2.0 | .24 |
| 20.0 | 1/49 | 7 | 14.6 | 2.6 | .17 | 27.8 | 3/50 | 7 | 14.7 | 2.7 | .22 |
| | | | | | | 27.6 | 3/50 | 4 | 33.2 | 1.2 | ... |
| 26.6 | 2/49 | 3 | 4.5 | 1.2 | .04 | 22.0 | 3/50 | 5 | 4.0 | .6 | .05 |
| | | | | | | | | | | | |
| 33.6 | 3/49 | 6 | 27.1 | 1.7 | .09 | 31.7 | 5/50 | 6 | 20.6 | 1.4 | .19 |
| 26.1 | 3/49 | 2 | 18.0 | 1.8 | .31 | 29.2 | 5/50 | 4 | 15.0 | 1.0 | .31 |
| 24.5 | 3/49 | 7 | 10.9 | 1.4 | .31 | 28.2 | 5/50 | 1 | 1.2 | .3 | .75 |
| 20.8 | 3/49 | 3 | 13.3 | 1.7 | .34 | 27.8 | 5/50 | 4 | 16.2 | 1.0 | ... |
| 20.0 | 3/49 | 2 | 6.2 | 1.3 | .31 | 26.8 | 5/50 | 1 | .6 | .9 | 1.50 |
| | | | | | | 22.5 | 5/50 | 2 | 3.0 | 1.1 | .33 |
| 25.3 | 4/49 | 2 | 15.0 | .9 | .63 | | | | | | |
| | | | | | | 35.0 | 6/50 | 6 | 24.5 | 1.4 | .23 |
| 30.0 | 5/49 | 5 | 20.6 | 1.4 | ... | 32.0 | 6/50 | 3 | 20.7 | 1.6 | .44 |
| 29.0 | 5/49 | 6 | 18.8 | 1.1 | .03 | 30.1 | 6/50 | 5 | 21.3 | 1.9 | .41 |
| 23.0 | 5/49 | 1 | 15.0 | 1.3 | .65 | 29.8 | 6/50 | 4 | 4.0 | .7 | .25 |
| 18.6 | 5/49 | 2 | 6.5 | 1.4 | ... | 29.3 | 6/50 | 5 | 9.7 | 1.4 | .13 |
| 18.5 | 5/49 | 2 | 12.5 | 1.0 | .04 | 29.0 | 6/50 | 5 | 16.9 | 1.7 | .21 |
| 16.5 | 5/49 | 2 | 4.9 | 1.4 | .08 | 28.1 | 6/50 | 4 | 6.7 | 1.5 | .15 |
| 16.5 | 5/49 | 1 | 16.3 | 1.9 | .26 | 27.6 | 6/50 | 5 | 10.1 | 1.3 | .17 |
| | | | | | | 18.8 | 6/50 | 2 | .5 | 1.0 | .40 |
| 31.8 | 6/49 | 4 | 25.5 | 1.6 | .27 | | | | | | |
| 28.2 | 6/49 | 3 | 17.0 | 1.3 | .29 | 45.0 | 7/50 | 11 | 19.2 | 1.4 | .06 |
| 23.0 | 6/49 | 2 | 11.7 | .7 | .51 | 32.6 | 7/50 | 5 | 10.0 | .9 | .60 |
| 19.0 | 6/49 | 1 | 18.4 | 1.5 | ... | 28.2 | 7/50 | 3 | 5.8 | 1.1 | ... |
| 16.6 | 6/49 | 1 | 2.4 | .5 | ... | 28.2 | 7/50 | 5 | 17.0 | 1.3 | ... |
| 16.5 | 6/49 | 1 | 3.7 | .8 | .08 | 23.6 | 7/50 | 3 | 17.6 | 1.4 | .61 |
| | | | | | | 23.0 | 7/50 | 3 | .5 | .7 | ... |
| 28.1 | 7/49 | 5 | 15.4 | 1.4 | ... | 22.0 | 7/50 | 1 | 2.8 | .7 | .29 |
| 19.6 | 7/49 | 1 | 11.3 | 1.4 | .23 | | | | | | |
| 15.8 | 7/49 | 1 | 1.1 | .3 | .64 | 52.0 | 8/50 | 10 | 23.7 | 1.5 | .06 |
| 15.0 | 7/49 | 1 | 5.2 | .7 | .44 | 24.6 | 8/50 | 3 | 2.9 | .6 | .48 |
| | | | | | | 18.5 | 8/50 | 3 | 3.5 | .7 | .06 |
| 16.0 | 8/49 | 2 | 14.0 | 1.9 | .37 | | | | | | |
| | | | | | | 54.0 | 9/50 | 8 | 12.9 | 1.5 | .09 |
| 27.3 | 9/49 | 7 | 26.2 | 1.0 | .05 | 21.0 | 9/50 | 1 | 2.4 | 1.0 | ... |
| 26.6 | 9/49 | 5 | 20.2 | 2.4 | ... | | | | | | |
| 19.8 | 9/49 | 6 | 2.8 | 2.4 | ... | 37.4 | 10/50 | 9 | 9.1 | 2.0 | .03 |
| 18.6 | 9/49 | 3 | 2.4 | .8 | ... | 32.5 | 10/50 | 8 | 10.5 | .9 | .06 |
| 18.4 | 9/49 | 5 | 4.4 | 1.4 | .05 | 28.5 | 10/50 | 2 | 1.4 | .9 | 2.78 |
| 16.2 | 9/49 | 4 | 15.3 | 2.0 | .44 | | | | | | |
| | | | | | | 36.9 | 11/50 | 4 | 12.3 | 1.3 | .22 |
| 22.0 | 10/49 | 2 | .6 | .4 | 2.16 | 30.0 | 11/50 | 5 | 6.4 | 1.2 | .67 |
| | | | | | | | | | | | |
| 28.8 | 11/49 | 5 | 15.6 | 1.4 | .24 | 37.5 | 12/50 | 7 | 22.6 | 1.1 | .29 |
| 28.7 | 11/49 | 7 | 13.0 | 1.3 | ... | 31.8 | 12/50 | 3 | 9.5 | .5 | ... |
| 27.6 | 11/49 | 7 | 15.6 | 2.2 | .17 | 28.8 | 12/50 | 2 | 4.3 | .4 | ... |
| 25.8 | 11/49 | 7 | 9.2 | 1.4 | .50 | | | | | | |
| 25.5 | 11/49 | 9 | 25.3 | 2.0 | .07 | 36.2 | 1/51 | 4 | 15.4 | 1.5 | .33 |
| 25.5 | 11/49 | 6 | 16.4 | 2.4 | .15 | 31.8 | 1/51 | 8 | 23.1 | 1.1 | .06 |
| 24.2 | 11/49 | 9 | 10.8 | 1.9 | .17 | 31.0 | 1/51 | 3 | 2.4 | .4 | 1.58 |
| 22.8 | 11/49 | 2 | 12.0 | .9 | .56 | 29.8 | 1/51 | 10 | 6.8 | .5 | .34 |
| 17.0 | 11/49 | 1 | 1.4 | .4 | 6.36 | | | | | | |
| 15.5 | 11/49 | 1 | .7 | .8 | ... | 39.6 | 3/51 | 6 | 17.6 | 1.4 | .02 |
| | | | | | | 34.5 | 3/51 | 3 | 7.7 | .7 | 1.19 |
| 32.3 | 12/49 | 8 | 17.0 | 1.4 | ... | 34.5 | 3/51 | 6 | 7.0 | .5 | .13 |
| 31.3 | 12/49 | 9 | 19.3 | 1.0 | ... | 28.2 | 3/51 | 2 | 6.6 | .3 | 1.97 |
| 30.0 | 12/49 | 5 | 30.1 | 2.1 | .05 | 25.6 | 3/51 | 4 | 10.0 | 1.3 | .32 |
| 26.4 | 12/49 | 7 | 35.9 | 1.5 | ... | | | | | | |
| 26.3 | 12/49 | 5 | 18.2 | 1.4 | .32 | 44.3 | 4/51 | 6 | 15.2 | 1.3 | .12 |
| 22.5 | 12/49 | 3 | 3.0 | 1.3 | .03 | 36.2 | 4/51 | 7 | .7 | 1.5 | .14 |
| | | | | | | 36.0 | 4/51 | 4 | 9.0 | 1.1 | .07 |
| 23.6 | 1/50 | 6 | 10.3 | 2.2 | .18 | 35.6 | 4/51 | 5 | 5.6 | 1.1 | .04 |
| 23.5 | 1/50 | 2 | 3.8 | .4 | .05 | 34.5 | 4/51 | 5 | 10.8 | 1.2 | .06 |
| 21.0 | 1/50 | 3 | 7.6 | 1.0 | .30 | 34.5 | 4/51 | 3 | 19.6 | 1.5 | .64 |
| 20.6 | 1/50 | 6 | 8.7 | .6 | ... | 32.5 | 4/51 | 3 | 21.4 | 1.5 | .43 |
| | | | | | | | | | | | |
| 32.0 | 2/50 | 3 | .7 | 1.6 | .86 | 52.0 | 5/51 | 9 | 21.7 | 1.1 | .16 |
| 27.6 | 2/50 | 5 | 14.8 | 1.0 | .08 | 41.5 | 5/51 | 4 | 11.3 | 1.2 | .47 |
| 26.5 | 2/50 | 8 | 14.2 | 1.0 | .13 | 36.0 | 5/51 | 3 | 8.7 | 1.1 | .06 |
| 26.0 | 2/50 | 7 | 9.0 | .8 | .69 | 34.6 | 5/51 | 6 | 9.8 | 1.0 | .04 |
| 22.8 | 2/50 | 6 | 14.7 | 1.6 | .66 | 34.1 | 5/51 | 3 | 14.0 | 1.4 | .48 |
| 20.0 | 2/50 | 3 | 2.9 | .5 | 5.86 | | | | | | |

Table 3. -- (continued)

| Sale price per MBF (dollars) | Date | Bids received | Pine volume | Pine cut per acre | Hardwood volume | | Sale price per MBF (dollars) | Date | Bids received | Pine volume | Pine cut per acre | Hardwood volume |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | 100 MBF | MBF | Ratio | | | | Number | 100 MBF | MBF | Ratio |
| 44.5 | 6/51 | 4 | 14.3 | 1.3 | .10 | | 43.0 | 6/52 | 4 | 40.4 | 1.4 | .22 |
| 42.1 | 6/51 | 4 | 6.3 | .9 | .32 | | 40.2 | 6/52 | 3 | 29.1 | 1.1 | .21 |
| 39.8 | 6/51 | 3 | 11.0 | 1.3 | .34 | | 39.8 | 6/52 | 5 | 17.4 | 1.3 | .16 |
| 39.0 | 6/51 | 6 | 9.7 | .8 | .66 | | 38.8 | 6/52 | 2 | 7.2 | .4 | .40 |
| 34.5 | 6/51 | 6 | 10.1 | 1.1 | .11 | | 38.3 | 6/52 | 5 | 5.3 | 1.0 | .21 |
| 33.2 | 6/51 | 5 | 33.6 | 1.2 | .38 | | 37.5 | 6/52 | 2 | 12.0 | .7 | .67 |
| | | | | | | | 37.1 | 6/52 | 4 | 15.7 | .8 | ... |
| 48.5 | 7/51 | 7 | 52.3 | 1.6 | .10 | | 33.5 | 6/52 | 2 | 1.9 | .3 | .58 |
| 38.0 | 7/51 | 8 | 24.0 | 1.3 | .05 | | 33.0 | 6/52 | 3 | 4.8 | .9 | 1.04 |
| 38.0 | 7/51 | 6 | 4.9 | 1.0 | .33 | | 32.2 | 6/52 | 5 | 11.9 | .9 | .01 |
| 35.3 | 7/51 | 3 | 12.1 | 1.4 | .17 | | 32.0 | 6/52 | 4 | 12.5 | .9 | .70 |
| 35.0 | 7/51 | 6 | 8.8 | 1.4 | .10 | | 29.1 | 6/52 | 1 | 2.2 | .5 | 1.59 |
| 34.0 | 7/51 | 4 | 3.8 | 1.2 | .32 | | | | | | | |
| 32.5 | 7/51 | 6 | 28.0 | 1.1 | .48 | | 37.5 | 7/52 | 3 | 17.7 | 1.7 | .12 |
| 28.3 | 7/51 | 2 | 1.2 | .2 | 1.17 | | | | | | | |
| | | | | | | | 43.0 | 9/52 | 5 | 31.8 | 1.2 | .21 |
| 53.3 | 9/51 | 7 | 38.7 | 2.3 | ... | | 36.4 | 9/52 | 4 | 34.4 | 1.3 | .10 |
| 42.3 | 9/51 | 8 | 17.4 | 1.9 | .09 | | 34.0 | 9/52 | 2 | 7.1 | .6 | .83 |
| 40.0 | 9/51 | 6 | 13.3 | 1.1 | .52 | | | | | | | |
| 40.0 | 9/51 | 5 | 8.7 | 1.5 | .36 | | 41.4 | 10/52 | 6 | 39.3 | 1.6 | .08 |
| 34.6 | 9/51 | 2 | 13.9 | 1.1 | .06 | | | | | | | |
| 33.6 | 9/51 | 4 | 6.2 | .8 | .66 | | 46.6 | 11/52 | 4 | 18.2 | 1.8 | .05 |
| 32.0 | 9/51 | 4 | 10.1 | 1.2 | .54 | | 44.5 | 11/52 | 3 | 18.5 | .9 | .25 |
| 24.5 | 9/51 | 1 | 5.2 | .7 | 1.79 | | 27.2 | 11/52 | 4 | 1.6 | .6 | ... |
| | | | | | | | | | | | | |
| 53.0 | 10/51 | 6 | 17.0 | 1.4 | .10 | | 43.0 | 12/52 | 7 | 19.6 | 1.7 | .04 |
| 42.5 | 10/51 | 4 | 14.5 | 1.3 | .27 | | 41.6 | 12/52 | 4 | 20.0 | 1.0 | .11 |
| 40.0 | 10/51 | 7 | 18.9 | .7 | .48 | | 40.4 | 12/52 | 1 | 13.2 | .9 | .11 |
| 34.0 | 10/51 | 4 | 6.2 | .5 | .15 | | 36.1 | 12/52 | 4 | 20.8 | 1.1 | .43 |
| 27.0 | 10/51 | 2 | 16.8 | 1.0 | .82 | | | | | | | |
| | | | | | | | 39.1 | 1/53 | 4 | 34.3 | 1.2 | .30 |
| 41.0 | 11/51 | 5 | 9.7 | .8 | .79 | | 37.5 | 1/53 | 4 | 14.9 | .8 | .07 |
| | | | | | | | 36.4 | 1/53 | 3 | 13.4 | .9 | .07 |
| 48.6 | 12/51 | 7 | 37.8 | 1.6 | .10 | | 33.6 | 1/53 | 1 | 2.9 | .8 | .28 |
| 38.5 | 12/51 | 5 | 3.6 | .6 | .97 | | 32.1 | 1/53 | 1 | 4.2 | .9 | .26 |
| 36.6 | 12/51 | 4 | 19.3 | 1.4 | .14 | | 27.0 | 1/53 | 4 | 5.2 | .7 | ... |
| 32.8 | 12/51 | 1 | .2 | 1.3 | .10 | | | | | | | |
| | | | | | | | 45.1 | 2/53 | 6 | 6.2 | 1.0 | .18 |
| 46.1 | 1/52 | 6 | 22.9 | 1.5 | .10 | | 40.3 | 2/53 | 4 | 11.4 | 1.6 | .32 |
| 45.1 | 1/52 | 6 | 37.8 | 1.5 | .05 | | 31.0 | 2/53 | 4 | 30.5 | 1.5 | .30 |
| 31.5 | 1/52 | 3 | 12.3 | 1.1 | .30 | | | | | | | |
| | | | | | | | 46.1 | 3/53 | 6 | 30.3 | 1.5 | .03 |
| 40.6 | 2/52 | 3 | 21.1 | 1.2 | .07 | | 45.9 | 3/53 | 8 | 30.8 | 1.9 | .14 |
| 37.0 | 2/52 | 4 | 10.8 | 1.5 | .22 | | 43.0 | 3/53 | 6 | 30.3 | 1.2 | .08 |
| | | | | | | | 39.2 | 3/53 | 4 | 12.5 | 1.2 | ... |
| 52.5 | 3/52 | 3 | 30.7 | 1.8 | ... | | 39.1 | 3/53 | 6 | 11.2 | .9 | ... |
| 45.0 | 3/52 | 4 | 10.5 | .8 | .40 | | 37.6 | 3/53 | 4 | 9.1 | .9 | .14 |
| 44.4 | 3/52 | 5 | 14.6 | 1.1 | .39 | | 37.0 | 3/53 | 1 | 7.2 | 1.6 | .10 |
| 39.2 | 3/52 | 6 | 16.4 | 1.3 | .44 | | 32.8 | 3/53 | 4 | 11.2 | .7 | .04 |
| 35.2 | 3/52 | 5 | 6.1 | .7 | .72 | | | | | | | |
| 33.0 | 3/52 | 2 | 10.3 | 1.3 | .90 | | 48.0 | 4/53 | 9 | 22.3 | 1.2 | .22 |
| 33.0 | 3/52 | 2 | 13.2 | 1.7 | .60 | | 41.1 | 4/53 | 5 | 7.7 | .9 | .30 |
| 24.5 | 3/52 | 3 | 12.6 | .9 | .39 | | 40.4 | 4/53 | 3 | 17.3 | 1.3 | ... |
| | | | | | | | 40.0 | 4/53 | 2 | 9.5 | .6 | .07 |
| 47.5 | 4/52 | 5 | 15.8 | .8 | .14 | | 37.9 | 4/53 | 4 | 15.5 | 1.2 | ... |
| 47.0 | 4/52 | 6 | 9.1 | .5 | .03 | | 34.0 | 4/53 | 7 | 21.4 | 1.2 | .29 |
| 45.0 | 4/52 | 4 | 10.7 | 1.2 | .33 | | 32.0 | 4/53 | 2 | 7.2 | .6 | .33 |
| 41.0 | 4/52 | 5 | 14.7 | 1.5 | .33 | | 26.0 | 4/53 | 2 | 22.0 | 1.0 | .27 |
| 39.2 | 4/52 | 6 | 9.3 | 1.4 | .09 | | 26.0 | 4/53 | 3 | 34.7 | 1.3 | .21 |
| 38.5 | 4/52 | 4 | 10.9 | .9 | .15 | | | | | | | |
| 38.4 | 4/52 | 1 | 3.3 | 1.2 | .33 | | 42.5 | 5/53 | 7 | 10.1 | 1.0 | .34 |
| 36.0 | 4/52 | 3 | 6.0 | .6 | .58 | | 38.4 | 5/53 | 3 | 20.0 | 1.1 | ... |
| | | | | | | | 31.6 | 5/53 | 1 | 13.2 | .8 | ... |
| 36.0 | 5/52 | 3 | 18.8 | 1.0 | .86 | | | | | | | |
| 35.0 | 5/52 | 6 | 22.7 | 1.0 | .19 | | 44.0 | 6/53 | 6 | 13.8 | 1.1 | .21 |
| 35.0 | 5/52 | 2 | 20.0 | 1.1 | .12 | | 42.5 | 6/53 | 5 | 13.9 | 1.1 | .32 |
| 33.0 | 5/52 | 5 | 16.9 | 1.1 | .33 | | 38.2 | 6/53 | 2 | 11.7 | 1.6 | .12 |
| 30.5 | 5/52 | 2 | 2.9 | .8 | .59 | | 37.2 | 6/53 | 4 | 18.4 | .9 | .49 |
| | | | | | | | 35.3 | 6/53 | 1 | 21.0 | 1.3 | .21 |
| | | | | | | | 35.3 | 6/53 | 2 | 21.6 | 1.1 | .34 |
| | | | | | | | 34.0 | 6/53 | 4 | 20.8 | 1.3 | .39 |
| | | | | | | | 33.0 | 6/53 | 2 | 10.0 | 1.0 | .16 |
| | | | | | | | 31.1 | 6/53 | 2 | 12.4 | .9 | .52 |
| | | | | | | | 24.0 | 6/53 | 1 | 5.3 | .6 | .17 |

Table 4.--Sales data for July 1953 through March 1955

| Sale price per MBF (dollars) | Date | Bids received | Pine volume | Pine cut per acre | Hardwood volume | Pine volume sum D² |
|---|---|---|---|---|---|---|
| | | Number | 100 MBF | MBF | Ratio | Bd.ft. |
| 42.1 | 7/53 | 4 | 12.0 | 1.6 | .22 | 56 |
| 32.5 | 7/53 | 2 | 30.1 | 1.3 | .27 | 63 |
| 43.4 | 8/53 | 1 | 32.6 | 1.5 | .06 | 57 |
| 38.8 | 8/53 | 2 | 43.4 | 1.1 | .12 | 60 |
| 38.5 | 8/53 | 4 | 19.0 | 1.7 | .10 | 55 |
| 31.5 | 8/53 | 3 | 13.6 | 1.2 | .25 | 60 |
| 27.2 | 8/53 | 1 | 51.5 | 1.6 | .04 | 55 |
| 39.5 | 9/53 | 5 | 36.6 | 1.2 | .18 | 69 |
| 36.0 | 9/53 | 3 | 34.4 | 1.6 | .10 | 59 |
| 23.6 | 9/53 | 1 | 16.8 | 1.5 | .03 | 53 |
| 31.7 | 10/53 | 1 | 8.4 | .7 | .92 | 57 |
| 29.5 | 10/53 | 1 | 22.7 | 1.2 | .13 | 57 |
| 28.2 | 10/53 | 1 | 15.3 | 1.3 | .48 | 57 |
| 35.9 | 11/53 | 2 | 19.4 | 1.6 | .10 | 59 |
| 32.2 | 11/53 | 3 | 21.8 | 1.6 | .01 | 53 |
| 23.1 | 11/53 | 3 | 12.4 | .5 | 1.12 | 73 |
| 40.6 | 12/53 | 3 | 29.8 | 1.6 | .09 | 71 |
| 26.4 | 12/53 | 3 | 7.2 | .6 | .03 | 44 |
| 24.1 | 12/53 | 4 | 20.7 | 1.7 | .10 | 64 |
| 31.3 | 1/54 | 1 | 21.7 | .9 | ... | 49 |
| 28.5 | 1/54 | 1 | 23.5 | 1.4 | .19 | 69 |
| 25.6 | 1/54 | 1 | 5.7 | .5 | 2.14 | 56 |
| 21.5 | 1/54 | 1 | 11.2 | .6 | .82 | 72 |
| 20.1 | 1/54 | 1 | 1.3 | .5 | 1.52 | 52 |
| 42.1 | 2/54 | 5 | 20.3 | 1.7 | ... | 67 |
| 39.1 | 2/54 | 4 | 27.0 | 1.7 | .10 | 64 |
| 31.0 | 2/54 | 1 | 14.8 | 1.3 | ... | 60 |
| 30.0 | 2/54 | 4 | 9.2 | 1.1 | .46 | 71 |
| 28.6 | 2/54 | 2 | 15.3 | 1.3 | .38 | 69 |
| 37.8 | 3/54 | 3 | 31.6 | 1.1 | .06 | 57 |
| 31.1 | 3/54 | 1 | 15.5 | 1.4 | ... | 63 |
| 30.5 | 3/54 | 2 | 26.4 | 1.3 | .23 | 58 |
| 29.0 | 3/54 | 3 | 14.1 | 1.6 | .28 | 69 |
| 28.0 | 3/54 | 4 | 12.4 | 1.6 | .22 | 65 |
| 27.3 | 3/54 | 3 | 5.3 | .7 | ... | 51 |
| 26.2 | 3/54 | 4 | 17.2 | 1.3 | .17 | 68 |
| 23.0 | 3/54 | 1 | 6.9 | .6 | .58 | 45 |
| 35.6 | 4/54 | 3 | 40.8 | 1.4 | .20 | 63 |
| 33.8 | 4/54 | 1 | 32.5 | 1.4 | .13 | 55 |
| 31.5 | 4/54 | 4 | 15.9 | 1.1 | .15 | 80 |
| 30.6 | 4/54 | 5 | 14.4 | 1.3 | .09 | 58 |
| 26.1 | 4/54 | 1 | 14.7 | 1.3 | .23 | 66 |
| 31.9 | 5/54 | 2 | 20.5 | .6 | .37 | 70 |
| 37.1 | 6/54 | 4 | 25.2 | 1.5 | .03 | 61 |
| 32.8 | 6/54 | 3 | 26.3 | 1.7 | .08 | 61 |
| 29.3 | 6/54 | 7 | 28.3 | 1.4 | .01 | 62 |
| 27.7 | 6/54 | 4 | 10.6 | 1.4 | .43 | 67 |
| 25.3 | 6/54 | 4 | 18.2 | .7 | .67 | 55 |
| 24.5 | 6/54 | 4 | 12.2 | .8 | .40 | 63 |
| 23.0 | 6/54 | 1 | 6.4 | .7 | .35 | 52 |
| 22.0 | 6/54 | 2 | 1.5 | .3 | 1.09 | 55 |
| 30.1 | 7/54 | 6 | 19.8 | 1.6 | .18 | 64 |
| 40.0 | 8/54 | 6 | 33.3 | 1.5 | .10 | 66 |
| 27.0 | 8/54 | 2 | 10.4 | .6 | .75 | 56 |
| 45.1 | 9/54 | 11 | 12.3 | 5.1 | .06 | 75 |
| 39.0 | 9/54 | 7 | 30.7 | 1.2 | .27 | 63 |
| 31.0 | 9/54 | 2 | 4.4 | .5 | .08 | 42 |
| 27.5 | 9/54 | 5 | 19.1 | 1.0 | .30 | 65 |
| 27.5 | 9/54 | 3 | 11.1 | .8 | .26 | 59 |
| 26.6 | 9/54 | 3 | 14.9 | 1.1 | .28 | 56 |
| 30.2 | 10/54 | 3 | 15.9 | .8 | .18 | 45 |
| 29.6 | 10/54 | 5 | 20.3 | 2.3 | .06 | 55 |
| 21.0 | 10/54 | 4 | 4.7 | .7 | .61 | 58 |
| 18.5 | 10/54 | 1 | 1.7 | .5 | 2.86 | 62 |
| 37.8 | 11/54 | 8 | 8.2 | .8 | .23 | 61 |
| 34.1 | 11/54 | 8 | 5.1 | .7 | .08 | 43 |
| 33.0 | 11/54 | 4 | 10.5 | 1.3 | .21 | 63 |
| 30.2 | 11/54 | 5 | 21.0 | 1.9 | .05 | 53 |
| 26.4 | 11/54 | 4 | 17.3 | .7 | .22 | 49 |
| 25.8 | 11/54 | 3 | 28.4 | 1.5 | .32 | 55 |
| 45.3 | 12/54 | 9 | 54.6 | 1.5 | .10 | 72 |
| 27.8 | 12/54 | 4 | 7.4 | .9 | .01 | 42 |
| 23.0 | 12/54 | 3 | 9.4 | .5 | .78 | 59 |
| 34.5 | 1/55 | 6 | 18.4 | 1.3 | .14 | 62 |
| 33.9 | 1/55 | 5 | 19.8 | 1.2 | .06 | 54 |
| 30.8 | 1/55 | 4 | 16.5 | .8 | .46 | 66 |
| 48.0 | 2/55 | 5 | 22.6 | 1.1 | .13 | 68 |
| 40.0 | 2/55 | 8 | 13.6 | 2.4 | .07 | 68 |
| 31.6 | 2/55 | 11 | 24.6 | 1.3 | .12 | 51 |
| 25.3 | 2/55 | 3 | 17.5 | 1.3 | .03 | 56 |
| 20.0 | 2/55 | 3 | 2.9 | .8 | 1.12 | 57 |
| 48.6 | 3/55 | 9 | 23.0 | 1.2 | .32 | 66 |
| 40.4 | 3/55 | 7 | 14.2 | .7 | .06 | 50 |
| 40.0 | 3/55 | 5 | 24.4 | 1.4 | .24 | 62 |
| 36.0 | 3/55 | 7 | 12.7 | 1.0 | .31 | 65 |
| 32.6 | 3/55 | 4 | 15.6 | .9 | .13 | 58 |
| 30.5 | 3/55 | 8 | 20.1 | .7 | .18 | 52 |
| 28.5 | 3/55 | 4 | 12.8 | .7 | .16 | 52 |
| 27.2 | 3/55 | 5 | 13.6 | 1.1 | .16 | 55 |
| 22.5 | 3/55 | 2 | 2.4 | .7 | .82 | 59 |
| 15.3 | 3/55 | 1 | 4.7 | .7 | .13 | 39 |